## REMARKS

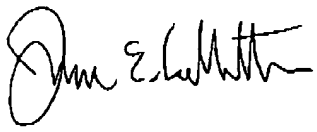
Allowance of this application is respectfully requested.

In view of an interview with Special Programs Examiner Bost on September 9, 2004, the specification is hereby amended to refer to additional continuation applications filed during October, 2003.

In light of the foregoing, it is respectfully submitted that the present application is in condition for allowance, and a notice to that effect is respectfully solicited.

If any issues remain which may best be resolved through a telephone communication, the Examiner is requested to telephone the undersigned at the local Washington, D.C. telephone number listed below.

Respectfully submitted,



Date: September 9, 2004

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# OPTICAL RECORDING/REPRODUCING APPARATUS FOR OPTICAL DISKS WITH VARIOUS DISK SUBSTRATE THICKNESSES

This is a reissue continuation application of reissue application no. 08/396,681 which issued as RE 36,443 on December 14, 1999, which was a reissue of United States Patent No. 5,235,581 issued August 10, 1993. The following are related continuation reissue applications: application no. 09/420,603 filed October 19, 1999, application no. 09/609,829 filed November 22, 1999, application no. 09/460,222 filed December 13,1999, application no. 09/460,223 filed December 13, 1999, application no. 09/460,221 filed December 13, 1999, application no. 10/677,167 filed October 2, 2003, which is a continuation of application no. 09/460,221, application no. 10/677,168 filed October 2, 2003, which is a continuation of application no. 09/420,603, and application no. 10/693,810 filed October 23, 2003, which is a continuation of application no. 09/460,223.

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to an optical disc apparatus which can record, reproduce, or erase information signals onto/from both of an optical disc having a recording density similar to that of a conventional CD (compact disc) and an optical disc having a recording density higher than the above recording density.

2. Description of the Prior Art

In recent years, in addition to an optical disc apparatus only for reproduction such as a CD player or the like, an optical disc apparatus which can record and reproduce an information signal is actively being developed.

Ordinarily, the recording and reproduction of an information signal onto/from an optical disc are executed by converging a beam which is radiated from a semiconductor laser or the like onto a recording layer of the optical disc by a lens. The recording layer here denotes a pit layer in the case of a CD and is a layer in which a deformation, a change in optical constant, a formation of a magnetic domain, or the like is performed by a converged laser beam in the case of a recordable optical disc. To raise a recording density of the optical disc, it is necessary to reduce a spot diameter D of the converged beam. There is the following relation among the spot diameter D, a numerical aperture NA of the lens, and a wavelength λ of the laser beam.

$$D = \frac{\lambda}{NA} \tag{1}$$

The above equation (1) denotes that the beam spot diameter D decreases by using a lens of a large NA. That is, by increasing NA, the high density recording can be executed.

When NA of the lens increases, however, an aberration of the converged beam due to an inclination error of the disc called a tilt increases. Particularly, a coma aberration increases. There is the following relation among a wave front aberration $W_c$ of the coma, a tilt angle α, and NA when using a thickness d and a refractive index n of the disc substrate.

$$W_c = \frac{n^2 - 1}{2n^3} \cdot d \cdot \alpha \cdot (NA)^3 \tag{2}$$

The above equation (2) denotes that in the case of using a lens of NA which is larger than that of the conventional lens, even if a tilt angle is identical, the coma aberration increases. It will be understood from the equation (2), however, that there is an effect to suppress the coma aberration by setting the thickness d of the disc substrate to be thin. In the optical disc for the high density recording, therefore, it is preferable that the thickness of the disk substrate is thinner than that of the conventional optical disc, so that an optical head using an objective lens corresponding to the thin disc substrate is needed.

On the other hand, even in the optical disc apparatus corresponding to the high density recording, it is preferable that the conventional optical disc of a thick sub-